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FIG. 15. *Cyclops tenuicornis* infested with *Distoma* sp. ?
" 16. *Simocephalus daphnoides*, sp. nov., head.
" 17. *Ceriodaphnia reticulata*, abdomen.
" 18. " head.
" 19. *Illiocryptus* sp., abdomen.
" 20. *Cyclops tenuissimus*, sp. nov., abdomen.
" 21. " caudal stylet.
" 22. *Cyclops tenuicornis* (" coronatus "), end of antenna.
" 23. *Scapholeberis armata* Herrick, front view.
" 24. " upper angle of abdomen.

(To be continued.)

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A STUDY OF THE IMMATURE PLUMAGE OF THE NORTH AMERICAN SHRIKES, TO SHOW THEIR DESCENT FROM A COMMON PROGENITOR.

BY THOMAS H. STREETS, M.D.

IT is seldom that we find a group where the variations can be traced from the progenitors in an unbroken line through the whole series. Such a group we have in the shrikes of North America.

Several years ago, before I had read the " Descent of Man," while studying the young of *Sula cyanops*, I was struck with its close resemblance to the adult plumage of *Sula leucogastra*. I brought this fact to the notice of Mr. Robert Ridgway, the ornithologist, and he showed me as a parallel case the young of the white-rumped and the adult of the great northern shrikes. I was strongly impressed by these cases, with the importance of the study of the changes of the plumages of birds, as bearing the same relation to their descent as the embryological changes of structure which certain animals exhibit. Some years afterwards I found out that Mr. Darwin had fully investigated the subject. In the beginning of the chapter[1] where he discusses the immediate plumage of birds he makes the following statement:

" When the young differs in color from the adult, and the colors of the former are not, as far as we can see, of any special service, they may generally be attributed, like various embryological structures, to the retention by the young of the characters of an early progenitor." He states, in reference to the importance of

[1] Descent of Man. Chap. XXI., p. 175. Amer. ed.

the subject, that "a full essay by some competent ornithologist is much needed." Neither did the color variations of the shrikes escape the patient search of this rigid investigator, but I am not aware that our own group has ever been studied to show their descent from a common progenitor. In this imperfect attempt I will select the marks of coloration of but one portion of the body; namely, the transverse wavy lines or bars and other masses of color on the under surface of the body. It is well known that spots and stripes are more apt to fade away or change than larger masses of coloration in the sexual variations of animals. All the facts here presented are taken from that excellent work, "A History of North American Birds, by Baird, Brewer and Ridgway."

Collurio borealis.—"Breast and belly always with distinct transverse waved lines of dusky." "In an immature bird, in winter, the dull white beneath is everywhere—sometimes even on the lower tail-coverts—covered with numerous bars of dusky, more sharply-defined, and darker than in the adult." Here we have, as far as this one character is concerned, the male, female and young resembling each other—"beneath with wavy bars of dusky in all stages."

C. ludovicianus.—This species carries us a step in advance. "Under parts often with very obscure faint waved lines (in the female?). Beneath, very strongly tinged with plumbaceous, laterally and across breast." The variation here has been transmitted through the female to the male, and in a modified degree to the female offspring. Our authors still further tell us that "the young bird is quite different from the adult, differing as does that of *excubitoroides*, but the colors are all darker than in the corresponding age of that species." Referring to *C. ludovicianus* var. *excubitoroides*, we are told that the young bird is marked on the "breast and sides with obsolete bars of dusky." In the case of *ludovicianus*, therefore, we have the young and female resembling each other, but differing from the adult male, and resembling, in a modified manner, both sexes and young of *borealis.*

C. ludovicianus var. *excubitoroides.*—"Beneath entirely white, without ashy tinge laterally or across breast." "No waved lines beneath." We have already seen that the young of this bird has obsolete bars of dusky on the breast and sides. It differs from both the male and female, and resembles the adult female of *ludo-*

vicianus. Here the male and female resemble each other, the sexual character being transmitted in an equal degree to both sexes. The only trace of the bars beneath is noticed in the winter dress of the male. According to Darwin, when the variation is sexual, and the adult male molts twice in a season, the winter dress resembles the primitive or immature plumage.

C. ludovicianus var. *robustus.*—The account of the plumage of this bird in its different stages is too meagre to serve our purpose. It is said to be without wavy bars beneath, and is " tinged with ashy laterally and across breast," in the adult stage. It is probably intermediate between *ludovicianus* and var. *excubitoroides.*

It is interesting to note in this connection the range of this genus spreading over half a continent.

The progenitor, *borealis*, inhabits " Arctic America; in winter south into the United States, especially into the northern portions." *Ludovicianus*, " South Atlantic and Gulf States." *Robustus*, " California and fur countries." *Excubitoroides*, " Western North America from Pacific coast east a little beyond the Mississippi, and to Texas. Nearly all of Mexico."

I am aware that this genus has also been modified in other ways by natural selection, but only those parts have been chosen which serve the purpose of showing their descent through sexual selection.

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EDITORS' TABLE.

EDITORS: A. S. PACKARD, JR., AND E. D. COPE.

—— There is still a disposition in certain quarters to disparage and even to ridicule attempts at the construction of genealogical trees. One criticism made is that they are nothing less than systems of classification. To this we would reply that of course they are. Our systems of classifications are efforts to display in a graphic way our conceptions of the affinities of natural groups. The more generalized forms are placed lowest and the more specialized higher, and the aberrant forms are placed at a distance from the more typical. Some naturalists arrange natural groups in the form of constellations; but the greater number, irrespective of any theory, copy, simply for convenience, the form of a tree with branches of unequal size and length. Unconsciously every systematic biologist thus constructs a genealogical tree. If now, he be an evolu-